

REPORT OF SIX OPERATIONS ON THE SPINAL
CORD FOR THE RELIEF OF
PARAPLEGIA.¹

By JOHN A. WYETH, M.D.,

OF NEW YORK,

SURGEON TO MT. SINAI HOSPITAL; PROFESSOR OF SURGERY IN THE
NEW YORK POLYCLINIC.

TO this date, April, 1894, my experience in the surgery of the spinal cord embraces six cases,—one was for compression of the cord by a tumor, three were cases of fracture of the vertebræ, one gunshot wound, and one pachymeningitis hæmorrhagica externa. All the patients recovered from the operation.

CASE I.—S. S., nine years; admitted to Mt. Sinai Hospital, May 28, 1889. One week before admission he began to be paralyzed from about the level of the navel down, and in twenty-four hours the loss of motion was complete; control of the bladder was lost, while the rectum was unaffected; sensation was not disturbed; reflexes present; slight dorsal kyphosis, which had not been detected by parents. Three days later the reflexes disappeared. A Sayre jacket was applied, and he was put to bed with extension from head and both lower extremities for three and a half months.

September 18. Suprapubic cystotomy for severe purulent cystitis caused by frequent catheterization.

December 3, 1889. Operation. Longitudinal incision over spines from second to eighth dorsal; laminae of fourth, fifth, and sixth dorsal vertebræ removed. As the laminae of the fifth vertebra was removed with the rongeur the dura was seen to bulge out for an area of about three-fourths of an inch. On opening the dura a small mass of cheesy-looking material was seen, partly within and

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projecting from the right posterior and lateral aspects of the cord. It was in shape spherical, with a diameter of less than three-fourths of an inch. It was carefully lifted out with the handle of a scalpel, and the surface of the cavity left after removal was mopped out with a film of cotton in weak bichloride solution. The dura was carefully closed with catgut; remainder of wound packed with gauze; dry dressing over all. By February 1, one month after, urination was voluntary; no reappearance of motion. February 9, signs of motion in legs and feet. By April 20 he walked well, and now, after four years and four months, the functions of the parts once paralyzed are normal. He runs, jumps, dances, etc. There is a more pronounced kyphosis than at the time of operation.

CASE II.—H. A., male; twenty-one years; March 17, 1890, came to me by courtesy of Drs. Luckie and Copeland, of Alabama. On September 1, 1889, he had been thrown from the cow-catcher of a locomotive, striking the rail and bounding from the track. Was picked up unconscious, and when his senses returned it was found that he had lost all power of motion from the pelvis down, and that the bladder and rectum were paralyzed. There were severe pains in the legs and feet. On April 30, 1890, I removed the laminae of the last two dorsal and first lumbar vertebræ. The bodies of the two vertebræ were crushed in such a way that the cord was partly divided, and the undivided part was compressed between the lamina of the vertebra above and the crushed and displaced body below. Compressing bone removed and dura closed as in all cases. There was immediate slight improvement in motion, especially in the feet. This improvement continued, and now, 1894, he has good use of the lower extremities,—can flex and extend thighs and legs, and the anæsthesia has disappeared above the knees. This case is one of the most encouraging instances of improvement after injury in which several months elapsed before operative interference. He has, however, to use a cane or crutch in locomotion.

CASE III.—C. T., ten years; Georgia; fell from a tree in 1892 and fractured the spine in the dorsal region. Four months after the injury he was brought to me. There was complete paralysis of motion and sensation from the level of the umbilicus down; rectum and bladder paralyzed. When the bladder fills with urine, tapping on the abdomen just over this organ will induce a regular or seemingly normal act of urination until the bladder is well emptied. The removal of the laminae of the sixth, seventh, and eighth dorsal vertebræ

demonstrated a fracture with laceration of the cord, the continuity of which was almost completely destroyed. There was no improvement after the operation. Boy still living and in excellent health. His mind is unusually developed, especially in power of memory, in which direction he is precocious. He still causes the evacuation of the bladder by beating a tattoo over this organ.

CASE IV.—G. D., sixteen years, June 28, 1890, fell about twenty feet, striking on the back, and was picked up conscious, but totally paraplegic. Sayre jacket for six weeks. Rectum and bladder paralyzed.

February 18, 1891. Patient well nourished; no motion below hips; no sensation from junction of middle with upper third of thigh down; urine overflows. Referred to me by Drs. Gibney, Watson, and McLaughlin for operation.

February 26, 1891. Removed laminae of eleventh and twelfth dorsal and first lumbar vertebrae. As the dura was exposed there was evidently a pachymeningitis in the thickened dura. The cord was small and soft; there was no direct compression of the cord. Wound closed as usual. Patient removed without improvement, and died in April, 1894; cause of death not known.

CASE V.—J. C.; Mississippi; thirty-one years old; in April, 1893, in good health, was shot by robbers; six pistol-balls, 38-caliber, entered the body at short range, and five lodged. The first missile passed through the alveolus of the left upper maxilla, wounded the tongue, and lodged in the pterygo-maxillary fossa. This bullet I removed. The second ball fractured the right clavicle and was buried in the trapezius muscle, also removed. The third bullet struck the skull at the occipital protuberance and lodged in the muscle at the back of the head and neck. A fourth missile struck a rib and again left the body. A fifth lodged in the deep muscles of the back. At the sixth shot he fell, conscious, but paralyzed in the lower half of his body.

This ball entered the skin of the back two inches to the right of the spinous processes, and entered the spinal canal through the right laminae of the third and fourth dorsal vertebrae.

November 20, 1893, I saw this patient. There was complete muscular and sensory paralysis below a line starting near the sixth dorsal spine and passing parallel with the ribs to near the ensiform cartilage of the sternum. The bladder and rectum were also paralyzed.

November 22, 1893. During operation I tracked the bullet to spinal cord. It entered, cutting a plug of bone out of the right laminae of the third and fourth dorsal vertebræ. A rim of lead was found adherent to this hole of entrance. The bullet passed forward, cutting the dura on the right side and the right portion of the cord, and passed beyond search into the body of the vertebra just in front. Several spiculæ of bone were found in the cord, and these had destroyed that portion not divided by the missile. The patient recovered and is in good condition, but there is no improvement in his paralysis.

CASE VI.—S. L.; male, fourteen years, in good health, fell backward, in January, 1894, striking on his back across the projecting edge of a plank. After three hours of unconsciousness he realized that both lower extremities were paralyzed, both as to motion and sensation. Rectum and bladder also paralyzed. For several days after injury he had chills or rigors, and developed high temperature. He was treated by his physician by careful attention to the bladder and bowels, nutritious diet, and the prevention of bedsores to March 8, six weeks after the accident, when he came under my care, and I had him removed to Mt. Sinai Hospital for operation.

He was seen here by Dr. Sachs in consultation, and it was found that there was complete loss of motion and sensation below the level of the ninth dorsal vertebra behind, to near the umbilicus in front. The variations of temperature in this case present an interesting study.

March 8. 6 A.M., 99.6°; 9 P.M., 103.7° F.

March 9. 6 A.M., 104.4°; 8 A.M., 102.5°; 11 P.M., 104.3°; 12 noon, 103.5°; 3 P.M., 104.7°; 6 P.M., 102.2°; 9 P.M., 103.5° F.

From 9 P.M., of March 9, it steadily declined, and at 6 A.M., March 10, it fell to 97°. By 3 P.M. of March 10 it was 103.5°; March 11, 12, and 13, there was little change from 101° to 103°; March 14 it fell, at 9 A.M., to 99.4°; 15 and 16, about 99° to 100°; 17, at 9 A.M., 101° to 102°, a chill came on, and temperature rose rapidly to 104°; 18 and 19, about 100°; 20, chill, 103.4°; 21, chill, 105°; 22, 102° to 104°; 23, 100° to 101°, operation; 24, 102°; 25, 100° to 104°; 26, 101° to 105.8°; 27, 101° to 105.8°; 28, 100° to 104.8°; 29, 101.5° to 103.3°; 30, 102°; 31, 97° to 102.2°; April 1, 101° to 105.2°; 2, 102°, and fell to 100°; 3, 101°, at 3 P.M. it fell to 98°, and by 5 P.M. 103°; 6, chill 3 A.M., 103.4°; 7, 99°; 8, 105°; 9, 101°; 10, 103°; 11, 101° to 103.8°; 12, 99° to 100°; 13, 100° to

101°; 14, 6 A.M., chill, 102°, by 3 P.M. 99°; 15, 103.5°, chill; 16, 9 A.M., 99°; 6 P.M., 105.2°; 17, 6 A.M., 103.3°; at noon he died, 102° F.

On March 23, I removed the laminæ of the ninth, tenth, and eleventh, and part of the eighth dorsal vertebræ. Between the dura and the bones was a layer of lymph about one-eighth inch in thickness, which could be lifted off by careful scraping with the dull scissors. This extended upward and downward as far as the canal was exposed. This membrane was like the rich plastic lymph which covers the intestinal peritoneum in some forms of appendicitis. The dura was incised for four inches, and a free quantity of cerebro-spinal fluid escaped. The cord was not bruised or divided, but seemed generally smaller than normal. The patient rallied well from the operation. The variations in pulse and temperature, which were present for three weeks before the operation, persisted to the end. The urine for some weeks before operation, and after this, was ammoniacal in odor, and contained pus, necessitating irrigation every six to ten hours with warm Thiersch's solution. He gradually and steadily declined from the day of injury to April 17, the date of death. The wound healed without suppuration. The cerebro-spinal fluid escaped from the wound in varying quantity to about six days before death, when the last drainage opening was closed. An autopsy was refused, much to my regret.

The technique I prefer is a free incision just over the spines, division of the attachments close to the bones with dull scissors or the elevator, strong retraction, and iodoform-gauze packing to contract and arrest bleeding. When well exposed, the laminæ are gnawed away in bits first by the round rongeur, and when an opening is effected by the more rapid cutting fenestrated rongeur. When exposed in full length of the injured region, and all bleeding stopped, the dura is carefully punctured with the scalpel, and as the first few drops of cerebro-spinal fluid escape, the grooved director is inserted, the dura split open in the middle line. This membrane should be closed by a careful continuous catgut suture. The muscles are sutured by subcutaneous catgut sutures, and the skin incision closed by silkworm, leaving a wick of iodoform gauze running from the dura out of the lower angle of the wound for drainage. Dry dressing over all. Each of my cases

healed without suppuration. The outflow of cerebro-spinal fluid continued from two to four days in all but the last case, in which it leaked out for several weeks.

From my experience, I would conclude,—

(1) The operation offers no great difficulty or danger.

(2) Paraplegia justifies exploration, and this should be done early in all cases where no improvement is marked. The degenerative changes, which occur from compression which has not divided the cord, add to the urgency of early interference.